DOCUMENT RESUME

ED 209 069 SP 035 570

TITLE Minorities and Mathematics. A Ford Foundation Staff Paper No. 415.
INSTITUTION Ford Foundation, New York, N.Y.
PUB DATE Aug 81
NOTE 29p.; Not available in paper copy due to copyright restrictions.

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Civil Rights; *Educational Change; *Educational Discrimination; Elementary Secondary Education; Higher Education; Mathematics; *Mathematics Education; *Mathematics Instruction; Minority Group Influences; *Minority Groups; *Program Descriptions

ABSTRACT

This report opens with a bleak picture of the kind of mathematics now taught within American classrooms. The situation for minority students is viewed as particularly grim. The Ford Foundation has launched a major national effort to improve minority students' performance in mathematics and to help mathematics teachers improve the quality of their instruction. The Foundation expects that the lessons learned and the techniques developed will help advance learning in science and mathematics for all students. Nine grants made recently as part of the Foundation's initiative into this area are profiled in the remainder of the document. (MP)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

Carolee E. Iltis

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

SE

ED209069

SE 035 570

A FORD FOUNDATION STAFF PAPER

One of a series of reports on activities supported by the Ford Foundation. A complete list of publications may be obtained from the Ford Foundation, Office of Reports, 320 East 43 Street, New York, New York 10017.

Library of Congress Cataloging in Publication Data
Main entry under title:

Minorities and mathematics.

1. Mathematics–Study and teaching–United States. 2. Minorities–Education–United States. I. Ford Foundation.

QA13.M56	510'.7'1073	81-12449
		AACR2

August 1981 #415

Contents

A National Intellectual Deficit	5
A Program for Mathematics Competence	6
Program Participants and Patterns	11
Particulars	13
Border College Consortium	*13*
Phillips Academy (Andover)	*15*
Tuskegee Institute	*17*
University of New Mexico	*20*
Lincoln University	*22*
Xavier University	*23*
Fisk University	*24*
Dartmouth College	*26*
American Association for the Advancement of Science	*27*

In August 1981 the Ford Foundation announced a major series of grants to improve the mathematical competence of male and female minority students—Afro-Americans, Puerto Ricans, Mexican Americans, and Native Americans. The lessons derived from new approaches in the nine projects supported will, it is hoped, also contribute to improvement in mathematics among American students generally.

A National Intellectual Deficit

The contemporary world is dominated by science and mathematics. There is scarcely a field that does not require some familiarity with their basic principles. Scientific knowledge provides the underpinnings of high-technology and national defense industries, and men and women seeking access to training in a variety of professions—from medicine, engineering, and architecture, to computer services and business management—require some competence in science and mathematics.

Although the United States has long been recognized as the world's leader in sophisticated technology, there are indications that its preeminence is threatened. Not only are other nations catching up, but the United States seems to be neglecting the preparation of future scientists and mathematicians, upon whom technological development depends. Signs are mounting that Americans are falling behind in mathematics and science training. In that respect

the nation might almost be called underdeveloped, especially in comparison to Japan and the Soviet Union.

Several studies over the past few years (the National Longitudinal Study, the National Assessment of Educational Progress, analyses of scores on Standard Aptitude Tests [SAT] administered by the College Entrance Examination Board) document a general decline in mathematics achievement among high school graduates nationally. This decline, together with a projection that the number of high school graduates in 1985 will be 15 per cent less than in 1975, threatens a major short-fall in the number of graduates with strong mathematics backgrounds. With fewer "math achievers" coming out of high school, fewer college students will be prepared to handle advanced training in high-technology fields, business, economics, and engineering.

Paradoxically, many educators suspect that the current emphasis on basic skills may be turning students away from mathematics. At its annual meeting in April 1981, the National Council of Teachers of Mathematics urged that the definition of basic skills be broadened to include more than minimal computational skills. Just as basic are the skills of problem solving, estimation, relating spatial and geometric ideas, measuring data, and using such tools as calculators and computers, the council said. The council's primary recommendation was that school mathematics be reorganized around the development of problem-solving ability. It also concluded that three years of mathematics between grades nine and twelve should be required for all high school graduates.

The National Council summed up the major problems as follows:

1. School mathematics is not keeping pace with changing technologies.
2. Most students are not taking as much mathematics in high school as they will need for their immediate or distant futures.

3. The present shortage of qualified mathematics teachers is increasing dramatically.

Difficulties with mathematics also extend to teachers, especially those who have had little training in mathematics or whose knowledge of mathematics is limited. Some teach it well, but others do not. In some states it is possible for an elementary school teacher to be certified without any college mathematics at all. And, it is estimated that nationwide one-quarter of all those teaching mathematics at the secondary level are not trained in the field. Many schools, especially in inner cities, cannot staff higher-level mathematics courses because of trouble hiring teachers who have the ability and background to handle such courses effectively. (According to a recent newsletter of the National Council of Teachers of Mathematics, "Certified teachers of mathematics are very difficult to find. In some large cities there was a ratio as low as one applicant for ten vacancies.")

One result of this dearth of math teachers is that many students drop mathematics after the second year in high school, not because they are not able, but because more sophisticated work is not encouraged and frequently not offered. Without second-year algebra and pre-calculus, students find college work in mathematics and careers in a variety of areas automatically closed to them.

Further, the kind of mathematics taught in American classrooms now is minimal. According to a study by Dr. James Fey, a mathematician at the University of Maryland, only one of the ten basic skill areas in mathematics—basic computation, or arithmetic—is taught across the board in elementary and secondary schools. Probability, estimation, and other facets of math that could be taught, even in the early grades, are largely ignored in American classrooms.

Barriers to Minorities

In this generally bleak picture, the situation of minorities is particularly grim. Many attend schools where the quality

of mathematics teaching and course offerings are minimal and in some instances poor. Few minority students know any successful professionals in math-based careers, such as engineers or physicists, much less mathematicians. Consequently, most are unaware of the career possibilities that proficiency in mathematics might open up to them. In many cases their families and teachers are similarly unaware of these possibilities and therefore do not encourage the students to concentrate on mathematics. Too often those who go on to college discover that inadequate high school preparation in mathematics has locked them out of advanced courses necessary for science and engineering majors. Those who look for a job after high school find themselves ill-equipped for training in technologically oriented work. Even in the military they are poorly prepared for learning to operate, maintain, or repair sophisticated weapons and machines.

In addition, many minority students become stuck in remedial courses. With remedial work, plus required courses in English and history, students often have no time for anything beyond introductory mathematics and science. Yet three years of high school mathematics are required for most college introductory mathematics and science courses.

A Program for Mathematics Competence

All of these problems are formidable, yet a common interest has emerged among many parties in improving mathematics and science training in American schools. This convergence links minorities (who seek equal educational and economic opportunity), universities (which face declining enrollments), industry and business (which need skilled technicians and qualified managers), and the federal government (which requires an increasingly sophisticated technological base for national defense). According to Franklin A. Thomas, president of the Ford Foundation,

"Here is a case where the interests of minorities and those of the society as a whole coincide directly."

To take advantage of this coincidence the Foundation has launched a major national effort to improve minority students' performance in mathematics and to help mathematics teachers improve the quality of their instruction. Although the program is directed specifically at minorities, the Foundation expects that the lessons learned and the techniques developed will help advance learning in mathematics and science for all students.

The Ford Foundation's Role

The Foundation has for many years had a broad commitment to advancing opportunities for minorities in American society. For example, a special $100 million program to improve opportunities in higher education extended from 1972 through 1978. The program had two aims: to help a selected group of private black colleges achieve greater academic quality, managerial ability, and financial stability, and to increase minority representation in college and university faculties by providing doctoral fellowships for Afro-Americans, Puerto Ricans, Mexican Americans, and Native Americans. Subsequently a major postdoctoral awards program was launched and is still under way.

On the particular subject of minorities and mathematics, however, the Foundation is something of a late starter compared to the National Science Foundation, the National Institute of Education, and a few other private foundations. The Foundation's interest in the subject was sparked by observations during the course of the doctoral and postdoctoral awards programs it supported for minorities. The general underrepresentation of Afro-Americans, Puerto Ricans, Mexican Americans, and Native Americans, as well as women, in science, mathematics, and related fields was glaringly evident. Just as evidently, in a society increasingly oriented to science and technology, these groups were not participating as fully as they might in

10 the nation's productivity and prosperity. The Foundation therefore began to take a closer look at the study of mathematics and science in college and in secondary and elementary schools.

First it commissioned reports on the general state of the problem: "Factors Affecting the Participation and Performance of Minorities in Mathematics," which was prepared by staff members of Minority Engineering Education Effort (ME³), and "Women and Mathematics," by Lynn Fox. The Foundation also sponsored three conferences—two in New York at the Foundation, the other at the University of California at Berkeley—to delve into the problem more deeply, to review existing intervention programs, and to elicit suggestions for additional programs. The conferences were attended by representatives of colleges, universities, schools, government agencies, other foundations, and private industry.

A major conclusion of the Foundation's eighteen-month investigation was that the entire system of mathematics education in the United States needs radical reform—in the way mathematics is presented, the number and kind of courses offered, and in the training of teachers, especially in the elementary and high school grades. At the same time, it was apparent that difficulties with mathematics and mathematics- and science-related subjects are especially acute among Afro-Americans, Puerto Ricans, Mexican Americans, and Native Americans of both sexes, and women generally. Their problems are so critical that they need special help right now on all levels—elementary, high school, and college.

The activities proposed under the nine grants discussed below are the first responses to the Foundation's initiatives.* For the Foundation these grants represent a clear-cut

*These activities will serve minorities of both sexes. The Foundation is also investigating ways to address the special problems that women of various backgrounds have with mathematics and sciences.

example of the linking of equity and excellence in education.

Program Participants and Patterns

Participants in the program will include a consortium of six community colleges on the U.S.-Mexican border, several predominantly black universities, public school districts in various parts of the country, a leading New England prep school, an Ivy League college, a state university, and the American Association for the Advancement of Science.

Initial grants in the program, totaling some $1.1 million went to:

Border College Consortium	$ 248,800
Phillips Academy (Andover)	316,400
Tuskegee Institute	341,000
University of New Mexico	30,000
Lincoln University	50,000
Xavier University	29,780
Fisk University	31,240
Dartmouth College	50,600
American Association for the Advancement of Science	39,058

Most of the grants are cooperative projects of two or more institutions, and most are planning or initiating programs with an eye to their usefulness and replication in other parts of the country.

The cooperative patterns vary—universities working with local school districts, with individual elementary and high schools, with community colleges, and with other universities. Many of the projects are seeking support from business and industry. Some will work with students and secondary school teachers, others only with students. Some focus on the problems of inner-city youths and teachers;

others address the special problems of isolated rural areas.

Common to most is recognition that students need a supportive community to get them on the track of mathematics and to help them stay there. They also take into account the differences among minorities and recognize that the students to be served attend different kinds of colleges and come from different regional educational systems, cultural backgrounds, and places. Activities will be tailored to various needs, and a variety of assistance is planned—for example, extra instruction after school or on weekends, teacher workshops, strengthened curricula, tutoring, field trips to local industries and laboratories, and work internships.

Three grants—to the Border College Consortium, Andover, and Tuskegee—are for full-scale intervention programs. They are designed to help students at various educational levels advance their understanding and achievements in mathematics and at the same time help mathematics teachers improve the quality of their instruction. (See pages 13–20 for details.)

Five other grants—to the University of New Mexico, Lincoln, Xavier, Fisk, and Dartmouth—are for research and planning preparatory to setting up intervention programs for minority constituencies. (See pages 20–27 for details.)

The effort supported by the grant to the American Association for the Advancement of Science approaches the problem from another perspective.

The AAAS will organize a network of minority professional groups in science, mathematics, and engineering to improve the sharing of information and to help coordinate their activities. The aim is to enlist the minority educational and professional communities in the effort to increase the numbers of minorities in science and science-related careers. (See page 27 for details.)

The projects are described more fully in the next section.

BORDER COLLEGE CONSORTIUM

The Border College Consortium is made up of six community colleges located in key communities along the 2000-mile U.S.-Mexico border. The colleges are: Southwestern College, Chula Vista, California; Imperial Valley College, Imperial, California; Arizona Western College, Yuma, Arizona; Cochise College, Douglas, Arizona; Laredo Junior College, Laredo, Texas; and Texas Southmost College, Brownsville, Texas. Together, the colleges have an enrollment of some 45,000 students, of whom approximately 75 per cent are Mexican Americans.

The mission of the Border College Consortium is to help its member institutions improve the total postsecondary educational experience of Hispanics and other nontraditional students in the area so that they may develop the knowledge and skills necessary to remedy the social and economic ills besetting the U.S.-Mexico border region. This region, which contains one of the largest concentrations of Mexican Americans in the United States, is characterized by very high unemployment and poor living conditions. Students attending the border community colleges are, for the most part, first-generation Americans from low socioeconomic backgrounds; typically they have poor English-language skills, low achievement levels, and a lack of confidence, particularly in mathematics and the sciences. For the vast majority of these young men and women the opportunities for success in math and science are extremely limited.

The proposed mathematics intervention program at each of the six member colleges of the consortium will be multi-faceted. It will emphasize the improvement of curriculum and the quality of instruction, strengthen counseling and tutorial services, and draw in the support of parents and peers. In implementing the program, the colleges will work concurrently with local secondary

schools, regional universities, their counterpart technical institutes in Mexico, and local and regional industry.

The Border College Consortium is well-suited to coordinate such a program. With Ford Foundation assistance it has already developed a network for the sharing of information and faculty and curricular resources among its members. The consortium has helped the colleges strengthen their capacities to recruit students, provide them with counseling and tutoring, and improve curricula and faculties. The consortium has also undertaken cooperative curriculum planning with the Mexican technical institutes across the border. Although considerable progress has been made by the consortium and member institutions in addressing the grave educational problems faced by Mexican American students in several subject areas, a comprehensive effort is now needed to increase the participation and performance of these students in mathematics and science-related courses. The new intervention program will be the first attempt to develop and put in place a comprehensive community college effort to increase the interest and performance of Hispanics in the field of mathematics.

Under the two-year Foundation grant, the consortium will carry out a range of activities, including:

—revision of the mathematics curriculum. Project staff will scrutinize in particular the math curricula of the nearby Mexican technical institutes, which serve a similar population of students.

—professional development activities for faculty in mathematics and math-related subjects and for counseling staff. These will include workshops and seminars, travel to professional meetings, and inter-institutional exchanges.

--training for student mathematics tutors. A short-term, intensive program will give tutors information and techniques to help them reduce the math anxiety of Hispanic students and communicate mathematics concepts more effectively. Tutors will also work with faculty to identify

specific student learning problems and devise appropriate remedies.

—parent and student information and involvement programs: for the parents, a newsletter and meetings, and for students, films, speakers, and conferences on math-related topics, field trips to medical and scientific laboratories and industries, and internships in math-relevant work settings.

PHILLIPS ACADEMY

Phillips Academy, better known as Andover, is a 200-year old, independent coeducational prep school in Andover, Massachusetts, about fifty miles north of Boston. Founded in 1778 by Samuel Phillips, Jr., it opened in an old carpenter's shop with thirteen students and a master. Today it has a 450-acre campus, 1200 students, 80 per cent of them boarders, a faculty of 200, and a rigorous college preparatory academic program.

Despite Andover's active recruitment of students from varied backgrounds and full scholarships for those of limited means, minority students represent only about 6 per cent of the student body. Finding that the main stumbling block for minority students from high schools in large cities was deficiency in math and science, Andover established the Mathematics and Science for Minority Students $(MS)^2$ program in 1977.

$(MS)^2$ provides intensive six-week sessions for three consecutive summers in mathematics, science, and English skills for inner-city minority boys and girls on the Andover campus. It also offers a four-, six-, or ten-week spring term of study on campus. Room, board, and tuition are free. Thirty new ninth graders enroll in the program each year. To date, $(MS)^2$ has served some 120 students. Two classes have completed the program and have been accepted at a variety of colleges and universities, including Brown, Harvard, and Purdue.

Andover now proposes to tackle a complementary problem affecting minority students' grasp of mathemat-

ics—the inadequate training and professional development of mathematics teachers in inner-city high schools. Beginning in the summer of 1982, an Institute for Teachers of Secondary School Mathematics will be launched under the joint sponsorship of Andover and Dartmouth College.

The Foundation's grant will enable Andover to continue the $(MS)^2$ program over the next two summers and will also help the new teachers' institute get under way; $150,000 is earmarked for $(MS)^2$ and $166,400 for the institute.

In intensive, four-week summer sessions, the Andover-Dartmouth institute for inner-city high school mathematics teachers will stress the theory and practice of secondary school mathematics, focusing on second-year algebra and pre-calculus mathematics. The director of the institute, in cooperation with local school administrators, will recruit five teachers from each of six cities for the summer of 1982. They will be drawn from school systems familiar with Andover through the $(MS)^2$ program. Additional city systems will be added in 1983. Ultimately, a team of Andover faculty will be available to offer the teacher-training program on location in a particular city, possibly funded by the public school system.

The teaching model selected by the Andover mathematics faculty calls for each participant to take two courses, coordinated with respect to content and order of topics. One course will be taught in a single section of thirty participants. The other will be divided into two fifteen-member sections, which will permit a more informal style of teaching and make it easier to tailor instruction to the needs and backgrounds of a diverse group of participants.

The Dartmouth sponsorship of the summer institutes will give greater credence to the program at institutions of higher education. It is likely that a certificate of attendance at the institute will allow participating teachers to meet continuing-education requirements necessary for raises and recognition. At the same time, since the burden of operating the institute will fall almost entirely to Andover,

the program will retain its major strength—a program for secondary school teachers conducted by secondary school teachers. The Dartmouth mathematics department will also staff an advisory committee that will review curriculum content, emphases, and methods, and provide speakers for two or three evening programs for the institute participants.

The $(MS)^2$ curriculum has evolved from years of experience. Adhering to a policy of no more than fifteen students per class, the math faculty provides a thorough grounding in algebra and trigonometry, in calculator and computer skills, and in the theory behind mathematical concepts. In science, the scholars learn laboratory techniques. For example, an environmental ecology course takes them to rivers and ponds where they collect water samples and marine life for analysis under a microscope. Starting in the summer of 1980, $(MS)^2$ students also received instruction in reading, writing, and speaking skills.

$(MS)^2$ also offers college counseling and assistance in making applications to competitive colleges and universities throughout the country.

Through 1980 $(MS)^2$ was supported by other foundations; that funding has been exhausted. The Ford Foundation's grant will sustain the program for two more years.

TUSKEGEE INSTITUTE

Three Alabama institutions of higher education, Talladega College, Auburn University, and Tuskegee Institute have joined in organizing an Alabama Regional Plan to improve teacher education and the performance of minority students in mathematics and mathematics-based subjects. Tuskegee will coordinate the program.

Talladega and Tuskegee are traditionally black institutions with long experience in providing a supportive but intellectually challenging environment for students whose prior education provided insufficient preparation for col-

lege-level work. Like many other black colleges and universities, they have become proficient in "taking students where they are," helping them to overcome educational deficiencies and go on to graduate. Auburn is a predominantly white, public university with limited experience in this area but with an increasing desire to learn. (Blacks now constitute 2.6 per cent of the student body.)

Tuskegee is one of the best known of the nation's private black colleges. Founded one hundred years ago in the heart of the Alabama black belt by Booker T. Washington, Tuskegee's original mission was industrial education. Over the years Tuskegee developed diversified curricula in the liberal arts and sciences. It also built strong professional programs in architecture, veterinary medicine, nursing, forestry, engineering, communications technology, and computer science. It has a rich history in the training of black scientists, including biologists and chemists, and in preparing its students for careers in engineering and industry. One of Tuskegee's most famous professors was the distinguished scientist, George Washington Carver. Currently there are some 4,000 students enrolled from 38 states, 28 foreign countries, and two U.S. possessions.

Talladega College was founded in 1867 by recently freed slaves with subsequent assistance from the American Missionary Association. Talladega was one of the first colleges in the nation to be chartered "for the education and training of youth, from which no one shall be barred on account of race or color" (or, it might be added, sex). With an enrollment of 800 students, Talladega has a strong liberal arts program, offering majors in education, the humanities, natural sciences, mathematics, and social sciences.

Auburn University, chartered in 1856, is a land-grant university in the eastern part of Alabama. In addition to its regular campus programs, it offers educational extension services throughout the state. Auburn has ten undergraduate schools including agriculture, business, engineering,

nursing, pharmacy and veterinary medicine as well as the arts and sciences.

During the past three years Tuskegee has conducted various studies and programs that have pointed up the need for better preparation of students in mathematics from grade school on and for assistance to elementary and secondary teachers for continuous development in mathematics.

Among other things, Tuskegee's research among black high school teachers at integrated schools and interviews with its own freshmen indicate that most minority students are not counseled to enroll in college preparatory courses, especially mathematics. Of particular concern is the underrepresentation of minorities in the four-year high school mathematics sequence (elementary algebra, geometry, intermediate algebra, trigonometry, and pre-calculus). SAT math scores for incoming Tuskegee freshmen in 1979–80 were 87 points below the national average. As a result 90 per cent of Tuskegee freshmen must take introductory or intermediate algebra and a half year of preparation for introductory calculus, a prerequisite for majors in science, engineering, and mathematics. The need to make up for deficiencies in high school mathematics preparation impedes students' normal progress in college.

The Foundation's grant will address students' poor preparation in mathematics from the elementary through undergraduate levels, place the major responsibility for the training of elementary and secondary math teachers in Alabama in the mathematics, science, and engineering departments of the state's universities, and coordinate the professional advancement of teachers already on the job with the performance of their students.

The goal of the Alabama Regional Plan is to upgrade the performance of third- and sixth-grade students in mathematics at selected elementary schools in Macon County, and ninth- and eleventh-grade students at the public high school in Tuskegee. (Alabama requires competency tests in mathematics for grades three, six, nine, and eleven.)

Efforts with students include:

—retention and intervention programs in selected elementary and secondary schools. The aim is to provide early identification, orientation, and preparation of students for majors in mathematics and science.

—weekend college and/or after-school sessions for high school students offering twelve to fifteen hours per week of additional study to prepare them for pursuit of mathematics-based majors.

—intensive Move Ahead Program (MAP) in college for lower-division students, modeled after a mathematics support workshop at the University of California, Berkeley.

Efforts with teachers include:

—mathematics workshops for third- and sixth-grade teachers.

—six-week summer training courses for ninth- and eleventh-grade teachers in the Tuskegee public high school.

—a public awareness campaign to encourage the introduction of a full four-year high school sequence of mathematics that will prepare students for calculus in college.

UNIVERSITY OF NEW MEXICO
(Southwest Resource Center for Science and Engineering)

New Mexico is a land of contrasts. On the one hand, it is a center of advanced scientific work in energy, cancer research, and space technology. It is the birthplace of atomic and hydrogen weapons, both developed at the Los Alamos National Laboratory. The state is also a growth area for high-technology industries. On the other hand, New Mexico is the home of some of the oldest and most traditional cultures in the United States. Mexican Americans make up some 40 per cent of the state's population, American Indians 9 per cent. These groups lag far behind the non-minority population in social, economic, and

educational conditions. They drop out of school at all levels, and their attrition rate is particularly high from the high school to university level. In standardized proficiency tests in reading, writing, and problem solving, Mexican Americans and Indians are far behind whites, and their scores are even lower in mathematics. At the university level they have serious problems in all math-based technical subjects.

The Southwest Resource Center for Science and Engineering was established to address these problems, specifically to improve the participation and performance of low-income and minority groups in the sciences and engineering. A joint effort of New Mexico State University and the University of New Mexico funded by the National Science Foundation, the center serves a tri-state area of Colorado, New Mexico, and Texas and the Navajo Reservation on the New Mexico-Arizona border.

Headquartered at the University of New Mexico in Albuquerque, the center has liaison officers who transmit the center's programs to ten institutions of higher education in the region.

The Foundation's grant to the University of New Mexico will enable the Southwest Center to join forces with the Northern New Mexico Community College (Espanola) and the Northern New Mexico Consortium for Rural Education to design a mathematics program for several school districts in the northern part of the state. The ultimate aim is a total restructuring of the mathematics programs in these districts from elementary school through high school.

Among the tasks to be accomplished during a one-year planning period are:

—analysis of the mathematics curricula of the community college and school districts in the consortium and assessment of the match between the training of mathematics teachers and the skills needed in the classroom.

—assessment of the available technologies (computers,

calculators, audio-visual aids, for example) that might be useful in the proposed program.

—determination of the role of the Los Alamos National Laboratory and other local and regional institutions in assisting the program.

Project staff contemplate introducing the new mathematics program at about the fourth-grade level. Among the changes being considered are the introduction of mathematics specialists to teach in elementary schools and the use of computer programs to reinforce and supplement classroom instruction.

LINCOLN UNIVERSITY

In the early 1970s Lincoln University, a predominantly black institution in Pennsylvania, founded in 1854, made a concerted effort to encourage its students to consider careers in the sciences. One year of college-level mathematics became a requirement for graduation. By 1976, however, a comprehensive analysis of the freshman class indicated that large numbers of students lacked the high school preparation necessary to handle college-level mathematics. Rather than drop the requirement, a mathematics laboratory was established, along with a series of developmental math courses offered as part of a freshman studies program.

The math lab and the developmental courses have been successful, but the problem of poor high school preparation remains a major handicap for incoming freshmen. Therefore, Lincoln concluded that it and similar institutions must concern themselves with and become involved in reaching students in secondary and pre-secondary schools to help assure their mastery of mathematical skills.

With its grant Lincoln will design a mathematics training program for some 500 black secondary school students in the metropolitan Philadelphia area. The program will be devised in cooperation with the Philadelphia public schools with a view toward transferring the conduct

and funding of the program to the public system after a try-out period.

Among the aims of the proposed program are a substantial increase in the number of minority students receiving thorough training in secondary-school mathematics to the level of introductory calculus, and an increase in the number of minority students aspiring to, and capable of handling, mathematics-based career studies in college, such as economics, statistics, physics, chemistry, engineering, and mathematics itself.

Activities during the planning period will include the selection and design of instructional content in algebra, geometry, trigonometry, and calculus; selection of training sites, teaching staff, and instructional materials; establishment of student selection criteria, and the design of student motivational activities and parent reinforcement programs.

The planning project will be conducted by a joint committee from Lincoln and the Philadelphia Board of Education.

XAVIER UNIVERSITY

Xavier University is a predominantly black Catholic institution in New Orleans, Louisiana. Recognizing that poor high school preparation in mathematics has handicapped minority students in advanced college-level studies, Xavier has for many years initiated or participated in programs to address this problem in the pre-college years. Some of these programs are:

–Project SOAR (Stress on Analytical Reasoning)–a six-week summer program for pre-freshmen interested in careers in science or mathematics and who expect to enroll at Xavier. The objective is to improve students' chances of succeeding in college science and mathematics courses.

–Student Science Training Program–enrichment courses for eleventh-grade students with high achievement in mathematics.

–Research Associates Program–a chance for high

school students of high ability to work with Xavier University researchers.

—Louisiana Engineering Advancement Program (LEAP)—a joint venture by businesses, universities, and community organizations, established in 1980, to encourage minority junior and senior high school students to consider preparation for careers in engineering.

—Information Dissemination for Science Education—a program for the exchange of information between Xavier faculty and junior and senior high school teachers on matters relating to mathematics and science education.

With the experience gained from these programs, Xavier faculty and staff now propose an extended, statewide effort to improve minorities' preparation in mathematics at both the college and pre-college levels.

To prepare for this new effort, Xavier received a one-year grant to assess the teaching of mathematics in the junior high and senior high schools of Louisiana, particularly as it affects the preparation of minority students for college study. To ensure statewide coverage, Xavier will cooperate with three other predominantly black universities (Dillard, Grambling State, and Southern) and with the LEAP program. All four universities serve areas with large concentrations of pre-college minority students.

During the planning period project participants will obtain from schools information on the performance of minority students on standardized mathematics tests, the number and qualifications of mathematics teachers, the effects of mathematics tracking in schools, and the degree of counseling support in mathematics at the schools. Based on this and other information, the project participants will then propose a program to remedy deficiencies.

FISK UNIVERSITY

For many years, Fisk, a predominantly black university in Nashville, Tennessee, has tried in a variety of ways (a mathematics enrichment laboratory for freshmen, for

example) to help students coming to Fisk with low test scores and generally low achievement in mathematics. Tennessee State University, another predominantly black institution in Nashville, has had similar experiences.

Both universities have concluded that exclusive concentration on remedying their students' low test scores and achievement in mathematics is not enough. A more lasting solution, they believe, will only be found in a rigorous analysis of the causes of the students' poor performance.

With a one-year grant Fisk and Tennessee State will examine a range of possible causes for the consistent differences in average mathematics performance levels between blacks and non-blacks. They will concentrate on the high schools and colleges in the Nashville area (Nashville is the site of more than a dozen colleges, several of which are predominantly black) as sources of information. One of the aims of the study is to devise programs both at the high school and college levels that have a greater probability than existing programs of overcoming minority students' problems with mathematics.

Staff from Fisk and Tennessee State will cull information from the colleges and high schools and elementary schools in the Nashville area to gain a clearer understanding of the causes of black students' below-average achievement. Subsequently the staff will develop modifications in the schools that might help to reduce the performance gap between blacks and non-blacks. These might include different teaching techniques, more effective personal and career counseling, increased student motivational activities, improved environments for study and teaching, and efforts to minimize the residual effects of past and present racial tensions.

After the study the staff will convene a small conference of faculty representatives from the two universities, representatives of the three Nashville high schools, and expert consultants. Following the conference, the project staff will prepare recommendations for a plan of action aimed at

meeting the problems of black students with mathematics on both the pre-college and college levels.

DARTMOUTH COLLEGE

In the last decade the composition of the Dartmouth student body has changed substantially—first with an influx of minority students starting in 1970, and then with coeducation in 1972. The percentage of minority students has held steady at about 10 per cent of the student body; the percentage of women has risen to 40 per cent.

If the class of 1984 is typical, minorities and non-minorities, women and men, have similar career aspirations. From 45 per cent to 50 per cent of each group plan careers in math or science; from 15 per cent to 18 per cent plan careers in medicine. However, at no time in the history of Dartmouth have minority students or women maintained these goals through graduation. In the current junior and senior classes, for example, only 35 of the 500 students majoring in mathematics, engineering, or science (biochemistry, chemistry, biology, physics) are minority students.

Although mathematics is not required at Dartmouth, over 90 per cent of minority and women freshmen enroll in introductory mathematics (and science) courses. But something happens to reduce or eliminate pursuit of these interests by the end of the freshman year. It is generally accepted by the faculty that the causes are different for minorities and women. Because minorities frequently receive inadequate instruction in mathematics before college, college-level math and science courses seem particularly difficult. For women the difficulties may be lack of confidence or peer pressure not to appear to be too bright in technical subjects.

Dartmouth has been able to respond to these problems in only a limited way (a modified introductory mathematics curriculum, tutorial labs, and an intensive academic support program, for example), but it intends to do more. It is now in the first phase of a planning effort that holds

promise of producing broader-gauged changes over the next two or three years. Because the effort is being undertaken by faculty members in addition to their other duties, it is going slowly.

A one-year grant will enable a member of Dartmouth's department of mathematics to complete an investigation of difficulties minority students have demonstrated at the college. The faculty member will spend three terms evaluating special mathematics programs for minorities at other colleges and universities; reviewing the literature on minorities' problems in mathematics; and analyzing the strengths and weaknesses of various corrective efforts currently under way at Dartmouth. These explorations are necessary before Dartmouth can devise a systematic institutional approach to helping minority students interested in mathematics and science persevere and succeed in those fields.

Among the possibilities the investigator will analyze are whether Dartmouth should expand its intensive academic support system for freshmen to include assistance in science as well as mathematics; create a technical/tutorial laboratory to help minority students in all science courses; include in course work historical material on minorities; create job internships in industry for minorities during a leave term; organize networks in the sciences for faculty and minority students; and create an institute for secondary school teachers and their students in connection with Dartmouth's Master of Arts and Liberal Studies program.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The AAAS is the world's leading general scientific society, with some 136,000 individual members and nearly 300 affiliated societies and academies. In addition to its publications, the weekly *Science* and the new monthly *Science 81*, AAAS engages in a variety of programs and activities that bear upon science and technology policy, the responsibili-

ties and human rights of scientists, international cooperation in science and engineering, and science education. Since 1973, when it established an Office of Opportunities in Science, AAAS has also been a strong advocate of efforts to accelerate the advancement of minorities, women, and the handicapped in the sciences and engineering.

In the past six months AAAS has sponsored three regional forums on minorities in science and the first national Conference of Puerto Ricans in Science. At all these working meetings, which brought together organizational representatives from the American Indian, Afro-American, Mexican American, and Puerto Rican science and engineering communities, participants requested the AAAS to establish a clearinghouse that would coordinate the efforts of the various groups working independently to increase minority participation in science and technical fields.

The AAAS will use its one-year grant to establish a network of minority professional organizations in science, mathematics, and engineering within its Office of Opportunities. The aim is to enable such groups to establish more formal ties with each other and with mainstream societies in the AAAS, to exchange program results, pool resources for joint ventures, and assist individual organizations in their local efforts to recruit minority students into science, engineering, and mathematics.

Ford Foundation
Trustees

ALEXANDER HEARD, *Chairman of the Board*
Chancellor, Vanderbilt University, Nashville, Tennessee

FRANKLIN A. THOMAS, *President*

RODRIGO BOTERO
Bogotá, Colombia

RALF DAHRENDORF
Director, London School of Economics and Political Science, London, England

WILLIAM H. DONALDSON
Chairman and Chief Executive, Donaldson Enterprises Incorporated, New York, New York

HEDLEY DONOVAN
New York, New York

JAMES R. ELLIS
Partner, Preston, Thorgrimson, Ellis & Holman, Seattle, Washington

NINA G. GARSOIAN
Centennial Professor and Director of the Center for Armenian Studies, Columbia University, New York, New York

WALTER A. HAAS, JR.
Chairman of the Board, Levi Strauss & Co., San Francisco, California

DOROTHY N. MARSHALL
Commonwealth Professor Emeritus, University of Massachusetts, Boston, Massachusetts

ROBERT S. MCNAMARA
Washington, D.C.

DONALD S. PERKINS
Chairman of the Executive Committee, Jewel Companies, Inc., Chicago, Illinois

HARRIET S. RABB
Assistant Dean for Urban Affairs, Columbia Law School, New York, New York

IRVING S. SHAPIRO
Chairman, Finance Committee, E. I. du Pont de Nemours & Company, Wilmington, Delaware

SOEDJATMOKO
Rector, The United Nations University, Tokyo, Japan

EDSON W. SPENCER
Chairman and Chief Executive Officer, Honeywell Inc., Minneapolis, Minnesota

GLENN E. WATTS
President, Communications Workers of America, Washington, D.C.

Executive
Officers

FRANKLIN A. THOMAS, *President*
SUSAN V. BERRESFORD, *Vice President*
WILLIAM D. CARMICHAEL, *Vice President*
HOWARD R. DRESSNER, *Vice President, Secretary, and General Counsel*
JON L. HAGLER, *Vice President and Treasurer*
ALVIN N. PURYEAR, *Vice President*